Geophysical Research Abstracts
Vol. 21, EGU2019-17868, 2019
EGU General Assembly 2019

Nutrient cycling and uptake in subalpine pasturelands in the Central Pyrenees

Cecilia María Armas-Herrera (1), David Badía (1), Juan Luis Mora (2), Alberto López (2), and Daniel Gómez (3)

(1) Universidad de Zaragoza, Escuela Politécnica Superior de Huesca, Ciencias Agrarias y del Medio Natural, Spain, (2) Universidad de Zaragoza, Facultad de Veterinaria, Ciencias Agrarias y del Medio Natural, Zaragoza, Spain, (3) Instituto Pirenaico de Ecología - Consejo Superior de Investigaciones Científicas, Jaca (Huesca), Spain

About one half of the area of southern Central Pyrenees (Spain) is dedicated to pastures. Summer grazing takes place at the high montane and subalpine belts (1500-2300m). Current vegetation is made by a mosaic of dense mesophilous pastures of Nardion strictae and Bromion erecti (phytosociological alliances) that extend into flat or gently sloping areas sprinkled with small patches of the nitrophilous communities of Rumicion pseudoalpini that indicate the livestock resting points [1,2]. Ridges and steepest slopes on basic substrata show sparse grasslands of Festucion gautieri or, in acid soils, of Festucion eskiae [2]. Decrease in stocking rate coupled with changes in livestock management in the last decades seems to be altering grassland mosaic structure, favouring Nardus stricta communities. In turn, erosion processes promote braking of dense pastures and their substitution by the other abovementioned grassland [4].

However, little is known on the soil processes involved in these vegetation changes. The aim of this work is to study the soil-plant relationships, focusing on nutrient cycling and uptake, under different grassland types coexisting in a subalpine area.

The experimental site was located in La Estiva (Huesca, Spain) at 1,700-1,900 masl on calcareous substrate. The vegetation is a mosaic of patches dominated by mat-grass (Nardus stricta) that alternate with eroded areas with less-developed vegetation. Six paired sampling points were selected in a side by side comparison of uneroded and eroded sites. In each case, a plant species inventory was performed and samples were collected from the topsoil (0-10 cm) and from the plant biomass to analyze the soil extractable and plant contents of N, Ca, P, S and K, and other soil characteristics related to nutrient cycling (soil microbial biomass, phosphatase, glucosidase).

Soil biological activity was lower in eroded sites than in uneroded sites, which is consistent to that observed in other mountain grasslands [3]. The highest Ca levels in soils and plants were found in eroded sites, and related to the occurrence of species characteristics of F. scopariae, in what appears to be an adaptation to the outcropping of Ca-rich material due to erosion. In contrast, the lowest soil levels and highest plant levels of P were found in uneroded sites, suggesting a large plant uptake of P leading to its depletion in soils. This finding is further supported by the high phosphatase activity observed under Nardion strictae, indicating a high demand for P. Finally, at both eroded and uneroded sites, the occurrence of species typical of Bromion erecti and Rumicion pseudoalpini was associated to higher plant levels of S, P, K and N. This indicates greater inputs of animal excreta resulting in larger accumulation of these elements in the plant biomass [1].

References

[1] Badía D. et al. (2008). J. Mt. Sci. 5:63-72.

[2] Benito Alonso JL (2006). Vegetación del PN de Ordesa y Monte Perdido (Sobrarbe, Pirineo central aragonés). Zaragoza: CPN Aragón.

[3] Park JH et al. (2014) Soil Biol. Biochem. 69: 382-392.

[4] Fillat F et al. (ed.). 2008. Pastos del Pirineo., 314 pp. CSIC - DP Huesca, Huesca.